

Summary of work done

C.Y. Tan
13 Feb 2020

Machine	Description	People	Status
Pre-Acc	Inserted 750 keV collimator	Kiyomi/Dan/ Pat	Lowered losses overall in Booster but not at injection. (28 Jan)
Pre-Acc	Penning source and test stand	Dan/Pat	Mechanical work on Penning source. Cleaned up arc modulator works better in test stand but no improvement seen in A. Hiring process for new Postdoc for PreAcc/Linac started.
Pre-Acc	Laser collimation of head/tail of longitudinal beam. (LDRD)	Dave	New style flange designed for easy install/uninstall. Waiting for quote.
Pre-Acc/Linac	Simulation of PreAcc + Linac	Valeriy/Kiyomi/Dan	Permanent magnets being considered.
Pre-Acc/Linac	Re-aligned RFQ	Kiyomi/Dan/Pat	Realigned during shutdown
Linac	Klystron testing	Kiyomi	One spare tested. Now testing klystron which had a repaired water leak.
Booster	Flat injection porch	Kiyomi/Bill/George/ Howie/Chris	Studies on 22 Jan.
Booster	Adiabatic capture	Chandra/Tan	Studies done of 26 Nov.
Booster	2 nd harmonic	Robyn/Tan	Repair has started (See photos taken on 21 Jan).
Booster	Wide bore cavity	John/Robyn	Low power tests completed. Still waiting for high power test (11 Feb)
Booster	2 stage collimators	Valeriy/Chandra	Meeting on 21 Jan 2020. Preliminary engineering design. Simulations to show calculate efficiency of these collimators to continue.
Booster	Injection girder and injector civil construction, and girder test stand	Dave/Salah/ Tan	E4R cleaned up. See photos taken on 21 Jan.
Booster	Garnet loss improvements	Robyn/Tan/Iouri/ Gennady	Preliminary design has been done. Meeting on 07 Jan.
Booster	Mode 2 longitudinal damper	Bill/Victor	Plan is to see whether 1 RF cavity (#8) can be used to damp mode 2. Studies 18 Feb
Booster	Kickers	Salah/TD	R&D to improve longevity of kickers has started (07 Jan)
LLRF	GMPS machine learning (get rid of reference magnet)	Bill/Brian/Kiyomi	Work continues with Rogowskii coil. Difference between 2 coils being tested.
LLRF	Complete DDS upgrade, paraphase controller	Brian/Ed	Studies on 22 Jan. Getting close. Studies planned on 18 Feb.
LLRF	LLRF	Brian/Ed/Bill/Tan/ Valeri/Craig	Clean up of deprecated/analog systems in LLRF room (05 Feb)

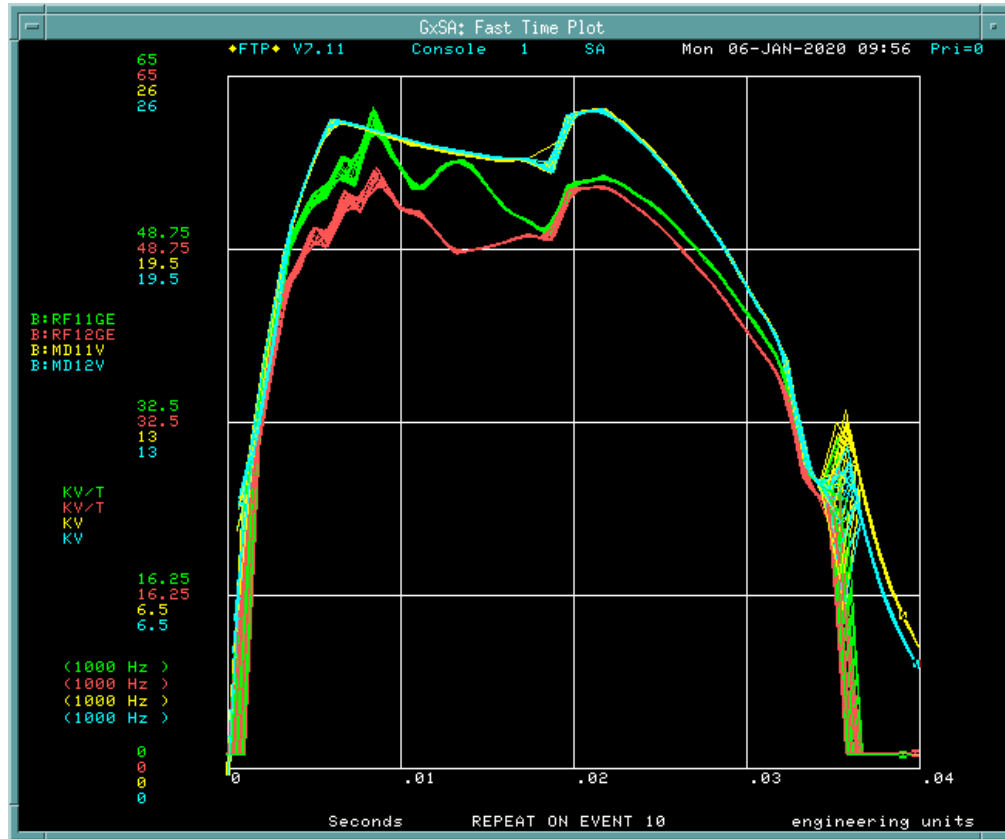
Task force updates

- Injection girder
 - Talked to Dan Wolf and Howie Pfeffer, we will have to do a SPICE calculation as to whether there will be an “imbalance” (transmission line modes) that will shake the beam because of the addition of 4 D magnets that are not identical to the D magnets in Booster. (30 and 31 Oct 2019)
 - Absorber review (20 Nov 2019) <https://indico.fnal.gov/event/22416/>
- Lattice
 - Method to reduce 1/2 integer tested.
 - See today's talk.
- Digital LLRF
 - Meeting on 22 Nov
 - Ed will discuss with Bill and Kiyomi about 2nd pass of signals required for Booster from PIP-II Linac
- Magnet girder tests
 - E4R has been cleaned up
 - Ryan Crawford setting up the space for the test. Plan is to have 15 Hz test done by end of 2020.
- 20 Hz infrastructure
 - Plan to have meeting soon

Task force updates (cont'd)

- 2 stage collimators
 - Task code has been supplied. Drawings started.
- Tall aperture gradient extraction magnets
 - See injection girder about the problem with GMPS with non-identical D magnets.
 - Calculation for gap size first pass says about +/- 5 mm required. However, needs benchmarking with current operations.
- 20 Hz cavity tests
 - Report has been written. Being reviewed (10 Feb)
- 50 kV in situ cavity test. Required for PIP-II
 - 2 cavities 11 and 12 are running at higher voltage. See next slide.
 - Modulator 11 power dissipation fault after 2.5 days of running. High voltage cable short.
 - All West gallery at higher RF voltage (05 Feb). Reduced again on 07 Feb. See next slide.
- Shielding assessment
 - First meeting held. M. Vincent (Safety) will be leading.
- Tevatron tunnel mods for BTL
 - New lattice means no more rolled dipoles to get above the ceiling.
 - A beam pipe will go straight through the tunnel. Removed when necessary to move magnets.
- BTL to L11 changes
 - In BTL, a (de)buncher to rotate bunch to get smaller dp/p . Space charge increases dp/p by 2x.
 - Collimators. 2 stage? Instrumentation?

Increased RF voltage on 2 cavities (06 Jan 2020)



BRF11 & BRF12 are running at 24.5 kV peak modulator voltage (22.85 on ACNET) modulator voltage with over 50KV gap voltage.

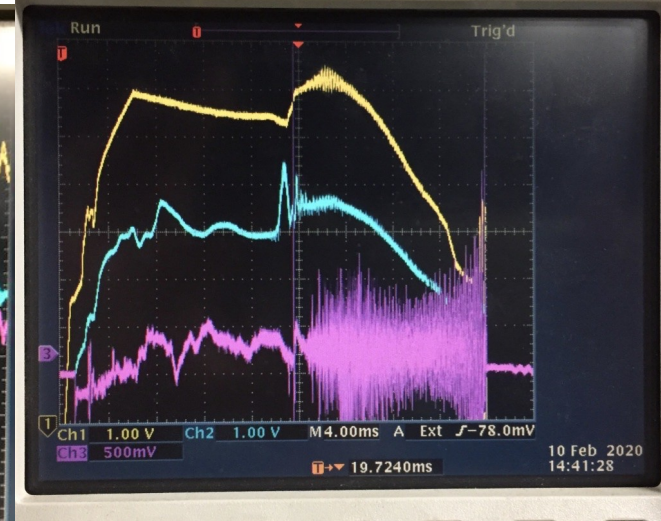
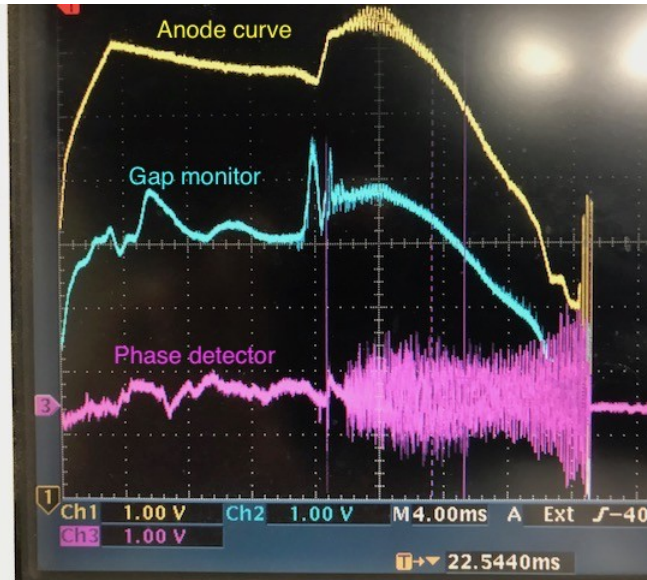
The plan is to run this way until the end of the run.

After 2.5 days (08 Jan), BRF11 short in high voltage cable in cavity. Replaced on 06 Feb.

After 10 days, BRF 12 failed on 16 Jan. Modulator deck fault: bad brick supply.

All west gallery cavities at higher RF voltage from 05 Feb to 07 Feb. Lowered again because of saturation of quad damper.

Increased voltage causing stronger quadrupole instability?



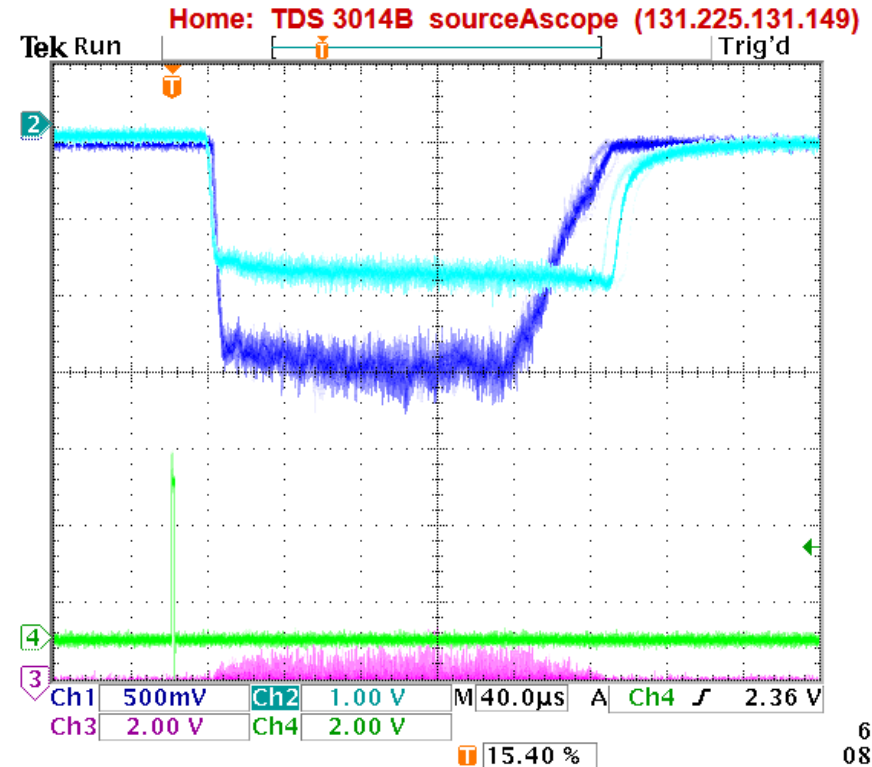
After lowering
anode curve

Increasing the RF voltage in the West gallery possibly revealed a problem: stronger quadrupole instability. Quad damper signal is clipping!
Phase detector also shows strong modulation of RF cavity *but* does not seem to damp mode 2.

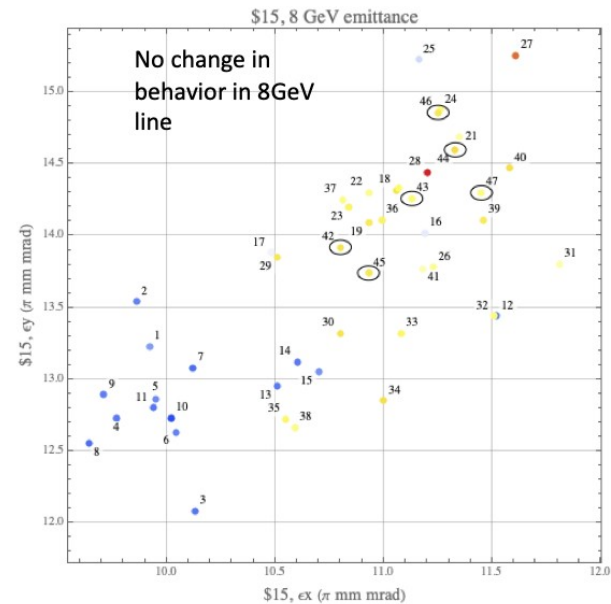
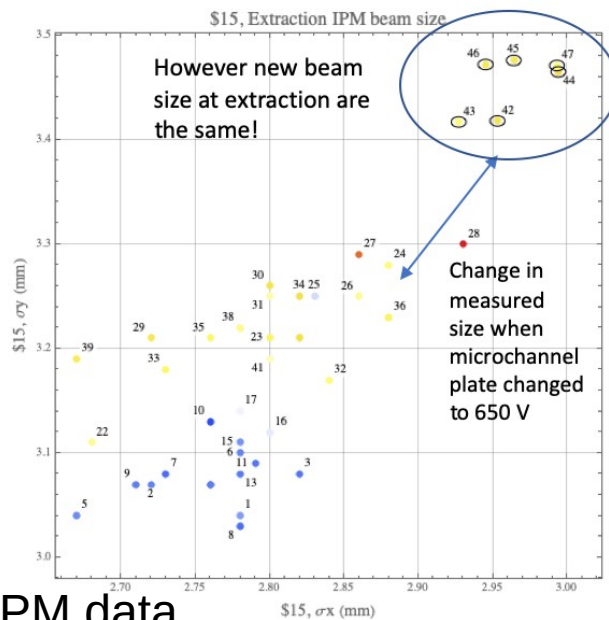
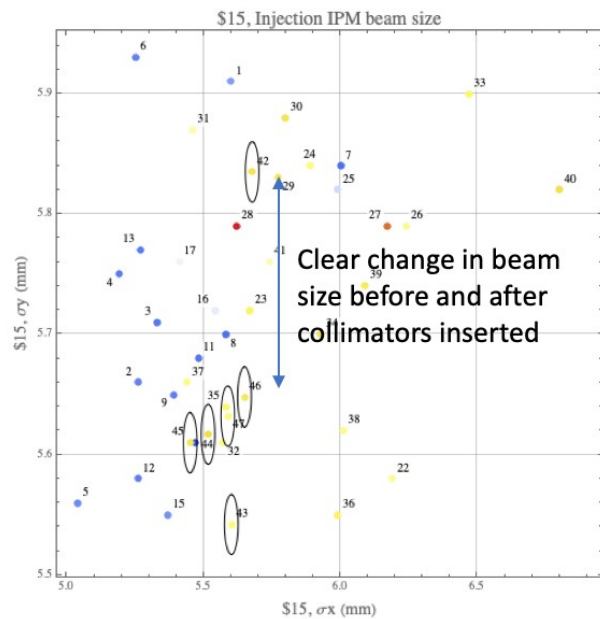
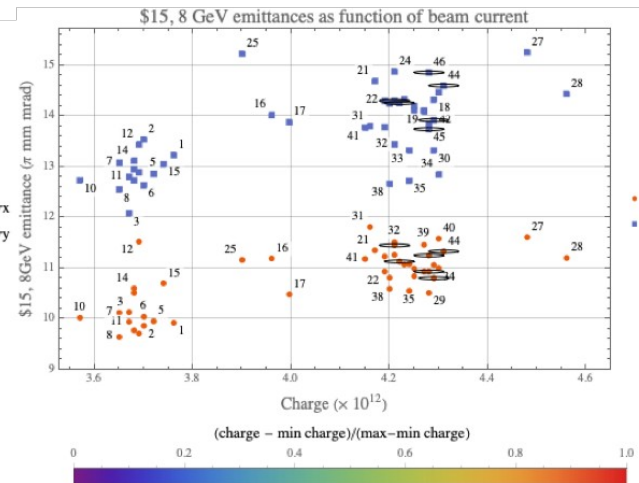
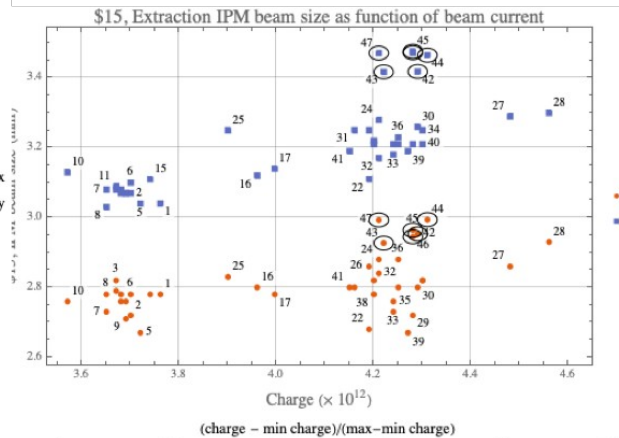
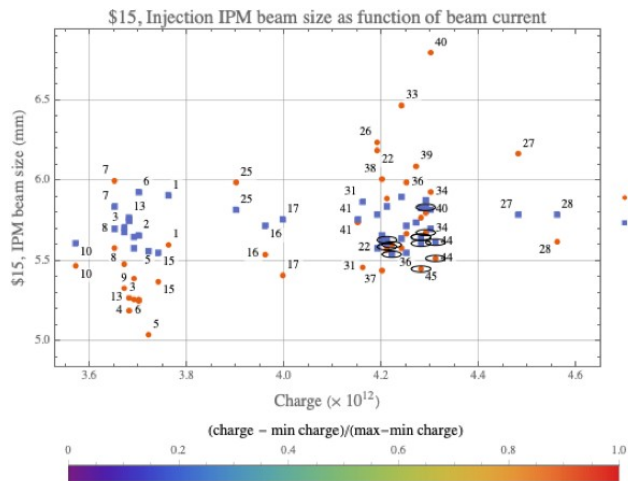
No improvement in A source with cleaned up arc modulator



Test stand

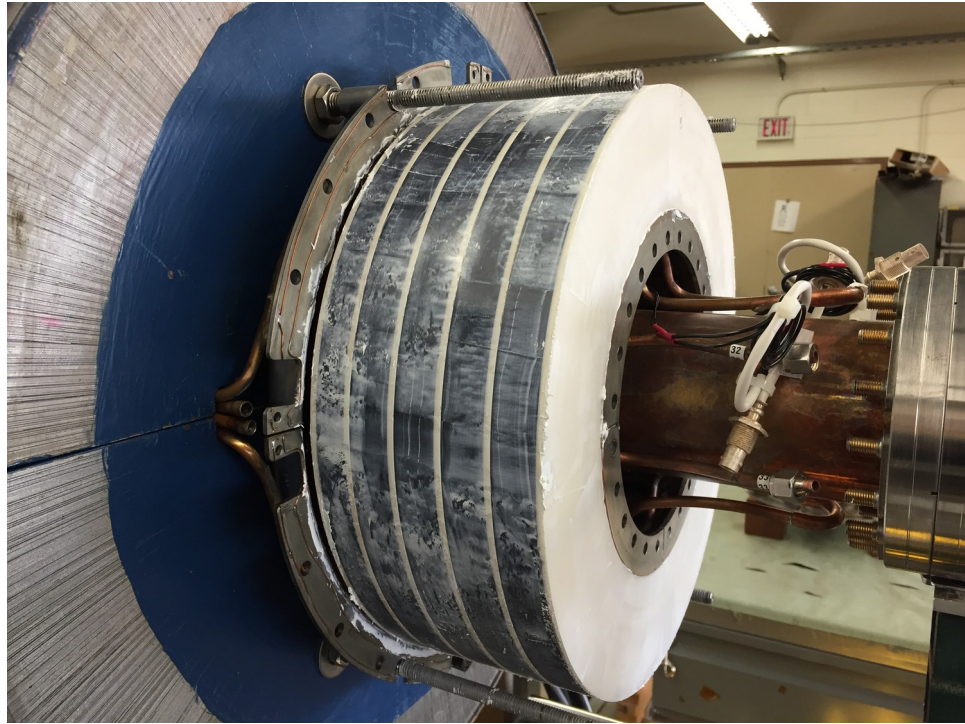


Source A



IPM data

2nd harmonic repair



E4R

